GSAS v4.0 Release Notes

GSAS Team

August 16, 2004

Introduction

GSAS 4.0 contains a time tag correction for the GLA04 gyro data, improvements in Atmosphere processing, improvements in waveform computations, and the addition of selected atmosphere parameters onto the elevation products.

For L1A, the following changes were made:

- Changed the GLA04 gyro time offset by adding -50ms to the GLA04 gyro time.
- Changed units/min/max of ADdetOutGn and ADdetRetGn on GLA03.

For Waveforms, the following changes were made:

- Fixed error that was that was throwing out some standard and alternate fits that were flagged as poor fit.
- Corrected condition where alternate fits were not attempted on some waveforms that had a standard fit.
- Fixed condition where there was no fit for some transmitted pulses.

For Elevation processes, the following changes were made:

- Added atmosphere parameters to the elevation products.
- Corrected the geoid heights on the elevation products. They are now properly referenced to the GLAS ellipsoid in a mean-tide system.
- Correctly set bit 40 of the range use quality flag.

For Atmosphere, the following changes were made:

- Fixed problems with the eta factor calculation (this factor the optical depth and extinction for the effects of multiple scattering), Range Delay (see 1607 below) and Lat/Lon in GLA10/11.
- Fixed bug in multiple scattering warning flag when layer when optical depth of a layer could not be calculated.
- Fixed bug in range delay and range uncertainty when no layers are sensed.
- Modified the threshold for ground detection in GLA09 to reduce occurrence of false positives
- Changed the 1064 channel calibration value for laser 1 data from 42 to 53. Calibration of 1064 now very good and verified by independent coincident measurements.
- Fixed bug in code that prevented the 1064 cloud layer detection routine from executing when the SPCMs (532 channel) were turned off.Other, more general fixes include:

Other, more general fixes include:

- Updated ANC45 versionID and parameter names.
- General code cleanup.
- General QA/Browse fixes.

Product Format/Definition Change Summary

GLA03:

i_ADdetOutGn : units changed to counts; min/ max changed to 0/255.

i_ADdetRetGn : units changed to counts; min/ max changed to 0/255.

GLA05:

i_WFqual: Bits 20 and 21 descriptions changed.

GLA07:

SolAng : units changed to microdegrees; min/max changed to –90000000/90000000; scale changed to 1.0d-6

GLA06, 12-15:

Replaced spares with the following atmosphere parameters: i_MRC_af from GLA09; i_cld1_msf, i_erd, and i_rdu from GLA11.

Replaced spare with i_atm_avail (flag to indicate availability of atmosphere parameters)

The latest product formats/descriptions will be available at http://glas.wff.nasa.gov/v40_products/.

Known Problems

GLA16 still not supported.

GLA09 and GLA08: Cloud Aerosol discrimination usually results in layers misidentified as aerosol when they should in fact be cloud. Problem is most severe in the high latitude regions and over the poles, and in regions of multiple cloud layers where signal attenuation from upper layer makes the lower layer ‘look’ like aerosol.

GLA07: Background computation problem in areas of very bright light cause signal to be poorly calibrated in some instances where the background is high.

Release Information

The ClearCase label for this release is RELEASE_4.0.

The release date is August 16, 2004.

Version numbers have been updated to “V4.0 July 2004" for the following:

- all libraries

- GLAS_L1A
- GLAS_Alt
- GLAS_Atm
- GLAS_Meta
- anc07_02
- anc07_05
- anc45_01-15

This should be verified during operation by checking the version information in the appropriate ANC06 files.

SMDS Impact

The distribution tarfile is on glasdev.wff.nasa.gov at the following location:

```
/glasdev1/v3/dist/gsas_V4.0.tar.Z.
```

ANC Files

New versions of the ANC07_00, ANC07_05, ANC13, and ANC45 data files are required.

Bundle Changes

GLA09 and GLA11 are now optional inputs to elevation processing. We would like to use GLA09 and GLA11 as “standard” inputs, but have a bundle available which would run manually without them.

Compilation

All libraries and binaries should be recompiled using the top-level Makefile. **IMPORTANT: due to internal changes in the makefiles, SDMS MUST use the command "make runtime" to ensure the software is made without debug flags.**

The process for making the libraries and binaries is as follows **(NOTE: SDMS ONLY!!)**

```
cd /install_dir/gsas_v4.0
make runtime
make install
```

Note : developers should not use the above procedure. This procedure is for SDMS only!

Detailed Change Notes

0001679: WFs Crashes In W_CalcFnP

Added check to avoid dividing by zero in W_LsqFit_mod.

0001675: ElevMgr Should Check NoFit Flag

Added a check for noFit before using range offsets from gla05.

0001665: Some WFs Have No Alternate Fit

Changed code so that the no-leading-edge and no-trailing-edge flags are not set if there is a signal.

0001659: Calibration change for 1064 Atmosphere for laser 1

1. The 1064 nm calibration constant was 25% too low. A value of 42 was hard coded into the GSAS code and was changed to 53. The 53 number is based on extensive analysis of coincident CPL (Cloud Physics Lidar) data from Feb-Mar, 2003. This change was made in the routine "A_cal_cofs_mod"

2. On GLA11:

- Re-defined range delay to altitude offset for altimetry by dividing by -2.0.

- Kept uncertainty positive by multiplying by -1.0.

0001654: Solar Angle Units need Changing in Product Variable Database

GLA07 parameter i_SolAng has been changed.
Prod Units: millidegrees chg-to microdegrees
Prod Min: 0 chg-to -90000000
Prod Max: 360000 chg-to 90000000
Alg Scale: 1.0d-3 chg-to 1.0d-6

0001653: GLA07 SolAng Change

Superceeded by 0001654.

0001651: GLA03 Return Gain Problem

On GLA03, the i_ADdetOutGn_v and i_ADdetRetGn the units were changed to counts and min/ max changed to reflect counts.

0001650: Problem while running L1A on ACCTest

The problem was a divide by zero. The parameters "d_background_avg_lower" and "d_background_avg_upper" were zero when there are no SPCM's enabled (as is the case for all of laser 1). Added checks to prevent recurrence of the problem.

0001649: Failed browse01 job 259345

When the input x vector had only one point, the program bombed when evaluating XGood[1:*]. Added code to take the other branch of the IF block including this statement.

0001646: Online Documentation of i_wfQual in GLA05 Needs To Be Changed

Documentation for i_WFqual flag in GLA05 has been changed. Bits 20 and 21 descriptions changed .

0001642: Range delay is not calculated correctly when optical depth is invalid.

The modifications clean up the parameters that are passed to the altimetry products when inputs are not available.

0001640: GLAS_Alt elevations bombs with SIGFPE in calcsploc:calcangle

This error was created due to an inconsistency between the WF Flags and the GLA05 data. Fixes in the waveform processing code alleviated this problem.

0001639: Atmosphere dies with SIGFPE

Problem was that no ANC40 (std atmosphere) was input to the process. While the code certainly does not provide adequate checks, the lack of an ANC40 should be caught an unresolved Mantis item which adds input sanity checking to atmosphere processing.

0001633: Release 18 anc45 and ESDTs

Updated anc45 to reflect release 18 data products and create ESDTs.

0001620: GLA06 d_ldRngOff has impossible value

Changed WFMgr so that d_centroid is not set to invalid unless there is no signal.

0001615: i_rng_UQF (i_RngOffQF) on GLA06 may be bad in 40th shot

Fixed array indexing in i_RngOffQF. In W_Assess, corrected setting of the l_WFqual flags gwi_noSig1, gwi_noSig2, gwi_noLeadEdg1, gwi_noTrlEdg1, gwi_noLeadEdg2, and gwi_noTrlEdg2.

0001609: Atmosphere flags added to elevation products

Added the following atmosphere parameters to GLA06 and 12-15: i_MRC_af from GLA09; i_cld1_msf, i_erd, and i_rdu from GLA11. The i_MRC_af flag is the number of cloud layers found at 1 second resolution. This will be the sum of the number of layers detected from the 532 channel and those detected from the 1064 channel. This means that if the 532 channel is not operational, this parameter would still contain the number of cloud layers detected from the 1064 channel. See 1607 below for a description of the parameters: i_cld1_msf, i_erd, and i_rdu. Added a flag to indicate the availablility of atmosphere data to GLA06 and 12-15: i_atm_avail. Fixed code in ReadData such that the data would not be set to invalid after the first second if a record-duration was greater than a second.

0001608: Some Poorly Fit Waveforms Are Shown As Not Fit

Fixed error in code that was throwing out poor fits. Fixed error in code that was not setting poorFit flags. The poorFit flags are now set if the standard deviation of fit is

greater than a number specified in anc07_0004. Changed the no-signal flag to be set if there is no leading edge OR no trailing edge (instead of AND). If the fit is the estimated fit, then the solution sigmas are set to invalid.

0001607: Add GLA11 cloud parameters to elevation products

Placed two parameters from GLA11 on the elevation data. These are the "multiple scattering warning flag" and the "range delay." The multiple scattering warning flag, which ranges from 0 to 15, indicates the potential severity of the multiple scattering effect due to cloud and/or aerosol layers on the altimetry result. A value of 0 indicates no or very little effect, and 14 is the greatest potential multiple scattering effect. A value of 15 means that cloud layers were present, but that their effect on multiple scattering could not be quantified. This usually happens with thick cloud layers that totally attenuate the beam. In these instances, it is unlikely to have a ground return suitable for altimetry. The range delay parameter is an attempt to quantify the effect of multiple scattering on the altimetry range result. It is a potential way to correct the altimetry range for multiple scattering. It is in millimeters and should be added directly to the range to correct it (since it is always negative or zero). Note that this number is calculated from a number of inputs, not all of which can be deduced from the atmospheric channels. The largest uncertainty is the particle size of the scattering layer which is obtained from a crude lookup table. Since the actual particle size of a scattering layer may differ substantially from that obtained from the table, and the range delay depends significantly on the particle size, the values of the range delay can have significant errors. See 0001609.

0001606: Metadata science QA flag set to "Failed"

Changed the science QA to "inferred passed".

0001592: Error in special processing in waveforms

Corrected the partial derivative of the area with respect to location. This is used in fitting saturated waveforms during special processing.

0001590: No Fit For Some Transmitted Pulses

Added a parameter (nSig) to anc07 which is used to determine the minimum peak amplitude for the transmitted pulse. Added code which attempts to fit the transmitted pulse even if there is no received signal.

0001587: QAbrowse fails to process QAP05 without valid along-track records

Fixed browse failure when no valid along-track QA data was available. Updated QAPCompare so the QAPFlags output file will contain the current metadata parameters.

0001580: GLA10 and 11 eta, range delay, and lat/lon problems

* added range limit test for cloud bs and ext profile
* corrected range limit test for aerosol bs and ext profile
* changed multiple scattering warning flag to 15 when layer is sensed but does not produce an optical depth

* set range delay and uncertainty to zero when no layers are sensed.
* corrected initialization of 4-sec lat/lon (indexed with i_c)
* set pbl4_ht% height paramenters to GLA09 input.
* initialized range delay, uncertainty, and particle size parameters to gd_invalid.
* moved 1-sec ground height equivalencing code to before no cloud condition early return.
* modified index of lat and lon from i_d to i_t.
* fixed calculation of eta.
* added out-of-range tests for eta inputs and eta
* added extra check for gd_invalid for the d_eta parameter.
* removed check on SPCM's enabled in order to enable 1064 layer detection for Laser 1.
* modified ground detection threshold (GD_GDET_FTR) from 5.0d0 to 9.0d0.
* Set GLA08%d_LRpbl_grd (low resolution PBL ground detection) to the the GLA09 value (cld4%d_grd_det) and GLA08%d_HRpbl_grd to the GLA09 value (GLA08%d_HRpbl_grd) for consistency between GLA08-09 products.
* Fixed array problems with lat/lon for GLA10 and 11.

0001579: GYRO time offset

Added a correction of -50ms to the GLA04 Gyro time offset. This change was made in the ANC07_05 file.

0001543: Geoid is incorrect in V3.9 data products

The original V3.8 correction factor (18.1 + 1.3 * { 9.9 - 29.6 * [sin(latitude)]^2 } cm) supplied by Dr. Pavlis was in error. The old factor was also subtracted from the original WGS-84 geoid height in V3.8 when it should have been added. The software used to rereference the geoid is attached. Three text files are also attached showing lat/lon/ht examples of: The original WGS-84 referenced geoid (version 1), the incorrectly repaired V3.8 file (version 4), and the corrected new version of the file (version 5). Delivered version 5 Geoid file.

0001538: Refinement of time selection in reforbit_util

An empirical modification to the reforbit_util software improves the locations available for the "seam" orbit track by correcting a small timing offset. This applies to any of the repeat cycle reference orbits currently being used.

0001497: Add A Flag To WFQual

Removed unused anc07_04 parameter. Added minimum signal width and minimum peak to noise ratio to anc07. Added new flag to wfQual in gla05 to indicate suspect waveforms (very small signal width or small max amplitude to noise ratio).

0001464 - ANC45 updates

Requested Parameter Name changes have been made to the ANC45 files. These changes flow into the product headers and, ultimately, the metadata files.

0001418 - Get error running qapg after adding 8 chars to GLA file names

QAPG code was changed to make QAPG function in the SCF environment with only the GLA04 LPA file as input.

0001397: QAP 01 Problems in Release 16

Corrected IF tests used to update QA_Sum%Sum_Out%i_num_WfAPIDs. Corrected calculation of number of expected waveforms. Replaced code used to determine end of along-track period with call to PastEndOfPeriod

0001317: GLAS_Atm bombs in a_interp_met

See 00001639.

0000808 - Elevation Manager Crashes in update_GLA06QA

Added check for invalid data before updating histograms.

Changed ANC07 Parameters:

ANC07_02

changed GD_GDET_FTR from 5.0 to 9.0

ANC07_04

added D_ABETA = 0.8

added D_NSIGTX = 1.5d0

added D_MINSIGWDTH = 5.0d0

added D_MINPK2NS = 5.0d0

ANC07_05

changed GD_GYRO_TIME_LAT from 0.001763d0 to -0.048237d0

Changed Files:

./Makefile

./cc_util/config_specs/gsfc_v0

./data/anc07_001_01_0000.dat

./data/anc07_001_01_0002.dat

./data/anc07_001_01_0004.dat

./data/anc07_001_01_0005.dat

./data/anc45_001_01_0001.dat

./data/anc45_001_01_0002.dat

./data/anc45_001_01_0003.dat

./data/anc45_001_01_0004.dat

./data/anc45_001_01_0005.dat
./data/anc45_001_01_0006.dat
./data/anc45_001_01_0007.dat
./data/anc45_001_01_0008.dat
./data/anc45_001_01_0009.dat
./data/anc45_001_01_0010.dat
./data/anc45_001_01_0011.dat
./data/anc45_001_01_0012.dat
./data/anc45_001_01_0013.dat
./data/anc45_001_01_0014.dat
./data/anc45_001_01_0015.dat
./idl/qa_browse/ReleaseNotes.txt
./idl/qa_browse/browse/qab04_alongtrack.pro
./idl/qa_browse/browse/qab04_barspage1.pro
./idl/qa_browse/browse/qab04_barspage2.pro
./idl/qa_browse/browse/qab04_histograms.pro
./idl/qa_browse/browse/qab04_lpaandlrsimages.pro
./idl/qa_browse/browse/qab05_writetabletoplot.pro
./idl/qa_browse/browse/qab13and15_upperlevelplot.pro
./idl/qa_browse/browse/qab_alongtrackstatplot.pro
./idl/qa_browse/browse/qab_plotclose.pro
./idl/qa_browse/browse/qab_readcntlfile.pro
./idl/qa_browse/browse/sample.txt
./idl/qa_browse/compare/qapc_metadata.pro
./idl/qa_browse/compare/qapc_readcntlfile.pro
./idl/qa_browse/compare/qapc_vectordata.pro
./idl/qa_browse/compare/qapcompare.pro
./src/atm_lib/vers_atm_mod.f90
./src/atmosphere/backscat/A_cal_cofs_mod.f90
./src/atmosphere/layers/A_lays_1064_mod.f90
./src/atmosphere/opt_props/A_aer_opt_prop_mod.f90
./src/atmosphere/opt_props/A_aer_opt_prop_mod.f90

./src/atmosphere/opt_props/A_cld_opt_prop_mod.f90
./src/atmosphere/opt_props/A_cld_opt_prop_mod.f90
./src/atmosphere/opt_props/A_opt_thin_mod.f90
./src/atmosphere/opt_props/A_opt_thin_mod.f90
./src/common_libs/anc_lib/anc07_wf_mod.f90
./src/common_libs/anc_lib/vers_anc_mod.f90
./src/common_libs/cntrl_lib/vers_cntrl_mod.f90
./src/common_libs/err_lib/vers_err_mod.f90
./src/common_libs/exec_lib/ReadData_mod.f90
./src/common_libs/exec_lib/vers_exec_mod.f90
./src/common_libs/file_lib/vers_file_mod.f90
./src/common_libs/geo_lib/vers_geo_mod.f90
./src/common_libs/math_lib/vers_math_mod.f90
./src/common_libs/platform_lib/const_wf_mod.f90
./src/common_libs/platform_lib/vers_platform_mod.f90
./src/common_libs/prod_lib/GLA06_Pass_mod.f90
./src/common_libs/prod_lib/GLA06_alg_mod.f90
./src/common_libs/prod_lib/GLA06_print_mod.f90
./src/common_libs/prod_lib/GLA06_prod_mod.f90
./src/common_libs/prod_lib/GLA06_scal_mod.f90
./src/common_libs/prod_lib/GLA10_scal_mod.f90
./src/common_libs/prod_lib/GLA12_alg_mod.f90
./src/common_libs/prod_lib/GLA12_print_mod.f90
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./src/common_libs/prod_lib/GLA15_alg_mod.f90
./src/common_libs/prod_lib/GLA15_print_mod.f90
./src/common_libs/prod_lib/GLA15_prod_mod.f90
./src/common_libs/prod_lib/GLA15_scal_mod.f90
./src/common_libs/prod_lib/vers_prod_mod.f90
./src/common_libs/time_lib/vers_time_mod.f90
./src/elev_lib/vers_elev_mod.f90
./src/glas_alt/ElevMgr_mod.f90
./src/glas_alt/GLAS_Alt.f90
./src/glas_alt/WFMgr_mod.f90
./src/glas_apid/GLAS_APID.f90
./src/glas_atm/AtmMgr_mod.f90
./src/glas_atm/GLAS_Atm.f90
./src/glas_l0p/GLAS_L0proc.f90
./src/glas_l1a/GLAS_L1A.f90
./src/glas_meta/GLAS_Meta.f90
./src/glas_reader/GLAS_Reader.f90
./src/glas_tick/GLAS_Tick.f90
./src/l1a_lib/qap04_mod.f90
./src/l1a_lib/vers_l1a_mod.f90
./src/qapg/V_read_control_mod.f90
./src/qapg/qapg.f90
./src/qapg/qapg_readgla_mod.f90
./src/qapg/qapg_specialcases_mod.f90
./src/waveforms/W_Assess/W_Assess_mod.f90
./src/waveforms/W_Common/W_LsqFit_mod.f90
./src/waveforms/W_FunctionalFt/W_FunctionalFt_mod.f90
./src/wf_lib/vers_wf_mod.f90